NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Material Science Department Material Technology and

"APPROVED"
Dean of the Faculty
of Design and
Engineering Faculty
_____ Zinoviy RUZHYLO
"___" _____ 2024

"APPROVED"
at the meeting of
Material Technology and
Material Science Department
Minutes №. 15 of "14" 05 2024
Head of the Department
_____ Kostiantyn LOPATKO

"REVIEWED"
Guarantor of the AP Sectoral mechanical engineering
_____ _____ Volodymyr BULGAKOV

CURRICULUM OF ACADEMIC DISCIPLINE

"Technology of machine building"

Field of knowledge 13 "Mechanical engineering"
Specialty 133 "Sectoral mechanical engineering"
Academic programme Sectoral mechanical engineering
Faculty Design and Engineering
Author(s): Associate professor, PhD. Svyatoslav GNYLOSKURENKO, S.Lecturer Hennadiy POKHYLENKO

Kyiv – 2024

Description of the discipline "Technology of machine building"
(name)

Academic degree, specialty, academic programme		
Academic degree	*bachelor's*	
Specialty	133 "Sectoral mechanical engineering"	
Academic programme	*13 "Mechanical engineering"*	
Characteristics of the discipline		
Type	compulsory	
Total number of hours	210	
Number of ECTS credits	7	
Number of modules	6	
Course project (work) (if any)	1	
Form of assessment	*exam 2 semester/credit 1 and 3 semesters*	
Indicators of the discipline for full-time and part-time forms of university study		
	Full-time	Part-time
Year of study	2,3	3
Semester	*IV, V, VI*	*V, VI*
Lectures	*15/30/15* hours.	*6/-* hours.
Practical classes and seminars	-	
Laboratory classes	*15/30/15* hours.	*16* hours.
Self-study	*30/30/30* hours.	*86* hours.
Number of hours per week for full-time students	*4/2* hours.	

1. Aim, objectives, competences and expected learning outcomes of the discipline

Aim To give the necessary knowledge to the future engineer-designer for the successful selection of technological methods for obtaining and processing billets to ensure high quality products, material savings, high productivity.

Objectives the study of technological methods of obtaining and processing of billets, their technical and economic characteristics, the study of the basic schemes of equipment, design of workshops of machine-building plants, issues of technological design of blanks, taking into account the methods of their obtaining, technological methods to improve the reliability of machines.

Acquisition of competences:

Integral competence (IC): The ability to solve complex specialized tasks and solve practical problems in the field of mechanical engineering using the theories and methods of modern science based on a systems approach and taking into account the complexity and uncertainty of the operating

conditions of technological systems.

General competences (GC):

GC1. The ability to think abstractly.

GC2. Ability to apply knowledge in practical situations.

GC5. Ability to generate new ideas (creativity).

GC7. Ability to communicate in a foreign language.

GC8. The ability to act socially responsibly and consciously.

GC10. Skills in using information and communication technologies.

GC12. The ability to realize one's rights and responsibilities as a member of society, to realize the values of a civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of a person and a citizen in Ukraine.

GC13. The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technologies, to use various types and forms of motor activity for active recreation and leading a healthy lifestyle.

Special (professional) competences (SC): competences

SC1. Ability to apply typical analytical methods and computer software tools for solving engineering problems of industrial mechanical engineering, effective quantitative methods of mathematics, physics, engineering sciences, as well as appropriate computer software for solving engineering problems of industrial mechanical engineering.

SC2. The ability to apply fundamental scientific facts, concepts, theories, principles to solve professional problems and practical problems of industrial mechanical engineering.

SC3. The ability to implement engineering developments in industrial mechanical engineering, taking into account technical, organizational, legal, economic and environmental aspects throughout the life cycle of the machine: from design, construction, operation, maintenance, diagnostics and disposal.

SC4. The ability to make effective decisions regarding the selection of construction materials, equipment, processes and to combine theory and practice to solve an engineering task.

SC5. The ability to realize creative and innovative potential in project development in the field of mechanical engineering.

SC6. The ability to carry out commercial and economic activities in the field of mechanical engineering.

SC7. The ability to develop plans and projects in the field of mechanical engineering under uncertain conditions, aimed at achieving the goal, taking into account existing limitations, to solve complex problems and practical problems of improving product quality and its control.

Expected Learning Outcomes (ELO):

ELO2. Knowledge and understanding of mechanics and mechanical engineering and their development prospects.

ELO3. To know and understand the systems of automatic management of objects

and processes of industrial engineering, to have skills in their practical use.

ELO4. Carry out engineering calculations to solve complex problems and practical problems in industrial mechanical engineering.

ELO7. Prepare production and operate products using automatic life cycle support systems.

ELO10. To understand the problems of labor protection and legal aspects of engineering activity in industrial mechanical engineering, the skills of forecasting the social and environmental consequences of the implementation of technical tasks.

ELO11. Communicate freely with the engineering community orally and in writing in national and foreign languages.

ELO 12. Apply means of technical control to evaluate the parameters of objects and processes in industrial mechanical engineering.

2. Programme and structure of the discipline for:

- full-time (part-time) form of study;
- reduced full-time (part-time) form of study

Modules and topics	Number of hours												
	full-time							part-time					
	weeks	total	including					in total	including				
			l	p	lab	ind	s.st		l	p	lab	ind	s.st
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Module 1: **Basics, fundamentals of machine building**													
Topic 1: Basics, fundamentals of machine building	1-2	6	2				4						
Topic 2: Fabricability (processability index, manufacturability, of products design	3-4	8	2	-	2	-	4						
Topic 3: Fundamentals of locating parts, workpieces, products	5-6	8	2	-	2	-	4						
Topic 4: Accuracy of mechanical processing and methods of its providing	7-12	30	7	-	9	-	14						
Topic 5: Quality of surfaces of machine parts and methods of its providing	12-13	8	2	-	2	-	4						
Total for module 1	60		15		15		30	32	2				30
Module 2. **Fundamentals of technical valuation**													
Topic 1: Fundamentals of technical valuation	14-15	7			3		4						
Total for module 2	7				3		4	6			2		4
Total hours													
Course project (work) _____ (if included in the curriculum)			-	-	-		-		-	-	-		-
Total hours													
Module 3. **Design of technological processes of mechanical processing**													
Topic 1: Design of technological processes of mechanical processing.	1-6		23	7		8		8					
Total for module 3	23		7		8		8	11	1		2		8
Total hours													
Module 4. **Devices for metalworking machine tools**													
Topic 1: Devices for metalworking	6-15	26	8		8		10						

machine tools													
Total for module 4	26		8		8		10		1		2		8
Total hours													
Course project (work) _____ (if included in the curriculum)			-	-	-		-		-	-	-		-
Total hours													
Module 5. **Typical technological processes of manufacturing parts**													
Topic 1: Machining, processing parts of "SHAFTS" class, type	1-2	12	4		4		4						
Topic 2: Machining, processing parts of "Sleeves" class, type	3	8	2		2		4						
Topic 3: Machining, processing parts of "Levers" class, type	4-5	12	4		4		4						
Topic 4: Machining, processing parts of "Discs" class, type	4-5	8	2		2		4						
Topic 5: Machining, processing parts of " Gears " class, type	6-7	12	4		4		4						
Topic 6: Machining, processing parts of "Body parts" class, type	8-9	12	4		4		4						
Topic 7: Manufacturing of working parts of agricultural machines	10-11	8	2		2		4						
Topic 8: Manufacturing of nonmetallic parts	12-13	4	2				2						
Total for module 5	76		24		22		30	37	1		6		30
Total hours													
Course project (work) _____ (if included in the curriculum)			-	-	-		-		-	-	-		-
Total hours													
Module 6. **Fundamentals of technology of assembly processes**													
Topic 1:	14-15	6	2		2		2						

Fundamentals of technology of assembly processes													
Topic 2: Automatization of assembly works	14-15	6	2		2		2						
Topic 3: Painting, drying, coating of parts		3	1				2						
Topic 4: Advanced machine building technologies		3	1				2						
Total for module 6	18		6		4		8		1		1		6
Total hours	210		60		60		90		6		16		86
Course project (work) _____ (if included in the curriculum)			-	-	-	108	-		-	-	-	15	-
Total hours	210		60		60		90		6		16		86

3. Topics of laboratory (practical, seminar) classes

№	Topic title	Hours
1	Determining the dependence of the surface turning error on the ratio of the dimensions of the part fixed in the chuck.	2
2	Investigation of the influence of temperature deformations of a lathe cutter on machining accuracy.	2
3	Investigation of the influence of the elements of the cutting mode on the roughness of the machined surface during turning.	2
4	Determination of the error of installation of the cutter on the size on a limb of the machine.	2
5	Determination of the dependence of temperature deformations of the spindle unit of the vertical - milling machine on the time of its operation and cooling.	2
6	Determination of the stiffness of the lathe. Determination of rigidity of a vertical milling machine by the production method	2
7	Determination of axial error, fixing the workpiece in a three-cam chuck.	2
8	Methods of studying working time. Timing of work on machines	2
9	Introduction. The main stages of technological process design. Preliminary elaboration of design decisions.	2
10	Determining the accuracy of processing with different methods of fixing the workpiece. Determination of base	2

	error during milling.	
11	Analysis of the manufacturability of the design of the part. Preliminary selection of production type. Release stroke.	2
12	Influence of product rigidity on vibration resistance of technological system.	2
13	Choice of cutting modes. Standardization of technological process.	2
14	Processing of profile surfaces on the grinder on the copier.	2
15	Choice of workpiece type. Basic requirements for blanks. Calculation of interoperative allowances for machining.	2
16	Technical control of details of a class "shafts"	2
17	Preliminary development of the technological route.	2
18	Technical control of body parts.	2
19	Determining the size of the closing link in the compensatory method of assembling assemblies and units.	2
20	Methods of designing tool settings.	2
21	Design of the installation and clamping device. Requirements for clamping mechanisms.	2
22	Calculation of the accuracy of the device and the clamping force of the workpiece.	2
23	Registration of technological documentation.	1

4. Topics for self-study

№ s/n	Topic title	Hours
1	Introduction. Tasks of the discipline. Basics, fundamentals of machine building. Production, technological processes.	4
2	Fabricability (processability index, manufacturability) of products design	4
3	Fundamentals of locating (basing) parts, workpieces, products. Principles of combining and dividing bases.	4
4	Accuracy of mechanical processing and methods of its providing.	14
5	Influence of part deformation and workpiece shape on machining accuracy. Total processing error.	4
6	Statistical methods of research of accuracy at mechanical treatment. Mathematical laws of determination at distribution actual dimensions of the processed surfaces.	4
7	Fundamentals of the theory of dimensional chains. Basic concepts and definitions.	4
8	Quality of surfaces of machine parts and methods of its providing	8
9	Purpose and tasks of designing. Technological documentation.	8

	The concept of ESKD and ESTD.	
10	Selection of equipment and facilities, accessories for a technological process.	10
11	Machine tool for the technological process of machining parts.	10
12	Mechanisms of machine tools.	4
13	Optimization of cutting modes.	4
14	Technical and economic indicators of the technological process.	4
15	Machining, processing parts of "SHAFTS" class, type	4
16	Machining, processing parts of "Sleeves" class, type	4
17	Machining, processing parts of "Levers" class, type	4
18	Machining, processing parts of "Discs" class, type	4
19	Machining, processing parts of " Gears " class, type	2
20	Machining, processing parts of "Body parts" class, type	2
21	Manufacturing of working parts of agricultural machines	2
22	Manufacturing of nonmetallic parts	2
23	Fundamentals of technology of assembly processes	2

5. Tools for assessing expected learning outcomes:
(select necessary or add)

- exam;
- credit;
- module tests;
- graphic design works;
- presentation of laboratory and practical works;

6. Teaching methods:

- verbal method (lecture, discussion, interview, etc.);
- practical method (laboratory, practical classes);
- visual method (illustration, demonstration);
- processing learning resources (note-taking,summarising, reviewing, writing an abstract);
- video method (remote, multimedia, web-based, etc.);
- self-study (completing assignments);
- individual research work;

7. Assessment methods:

- exam;
- credit;
- oral or written assessment;
- module tests;
- team projects;
- essays and reports;
- presentation of laboratory and practical works;

- presentations at academic events

8. Distribution of points received by students

The assessment of students' knowledge and skills is conducted by means of a 100-point scale and is converted into national grades according to Table 1 of the current *Exam and Credit Regulations at NULES of Ukraine*.

Student's rating, points	National grading of exams and credits	
	exams	credits
90-100	excellent	pass
74-89	good	
60-73	satisfactorily	
0-59	unsatisfactorily	fail

To determine a student's rating in the discipline $\mathbf{R_{DIS}}$ (up to 100 points), the received assessment rating $\mathbf{R_A}$ (up to 30 points) is added to the academic performance raiting $\mathbf{R_{AP}}$ (up to 70 points): $\mathbf{R_{DIS}} = \mathbf{R_{AP}} + \mathbf{R_A}$.

9. Teaching and learning aids

- e-learning course of the discipline
  Part 1. ***https://elearn.nubip.edu.ua/course/view.php?id=1291***
  Part 2. ***https://elearn.nubip.edu.ua/course/view.php?id=1162***
- lectures and presentations (in electronic form);
- textbooks, manuals, tutorials;
- guidelines for studying a discipline by full-time and part-time students;

10. Recommended sources of information

- **Main:**

1. Матеріалознавство і технологія конструкційних матеріалів: підруч. для вищ. навч. закл. України / А.С. Опальчук, Є.Г. Афтанділянц, Л.Л. Роговський, О.Є. Семеновський [та ін.]. – Вид. 2-ге, перероб. і допов. – Ніжин: Лисенко М.М., 2013. – 751 с.
2. Основні поняття і принципи технології машинобудування. Методичні вказівки з дисципліни "Технологія машинобудування" для студентів спеціальності (освітня програма) 133 «Галузеве машинобудування». К, НУБіП України. Укл. Семеновський О.Є., Похиленко Г.М.
3. Технологія сільськогосподарського машинобудування: підруч. для вищ. техн. закл. України / Б. М. Гевко [та ін.]. – Вид. 2-ге, перероб. і допов. – Тернопіль : Паляниця В. А., 2015. – 418 с.– ISBN 978-617-7331-10-9.
4. Технологія машинобудування. Проектування та виробництво заготованок [Текст] : підручник для студ. машинобуд. спец. вищ. навч. закладів / Л. І.

Боженко. – Львів : Світ, 1996. – 368 с. – ISBN 5-7773-0319-6.
5. Технологічні процеси отримання заготовок для сільськогосподарського машинобудування. Методичні вказівки з дисципліни "Технологія машинобудування" для студентів спеціальності (освітня програма) 133 «Галузеве машинобудування». – К., НУБіП України. Укл. Семеновський О.Є., Похиленко Г.М.
6. Технологія машинобудування. посібник для студ. машинобуд. спец. вищ. навч. закладів / Є.О. Горбатюк, М.П.Мазур та ін. – Львів: Новий Світ, 2009. – 358 с. РОЗМІРНІ ЛАНЦЮГИ Навчально-методичний посібник. Ю.Є. Паливода, А.Є. Дячун, Ю.Б. Капаціла, І.Г. Ткаченко. - Тернопіль : Тернопільський національний технічний університет імені Івана Пулюя, 2018. – 132 с.

– Additional:

1. Медвідь М.В., Шабайкович В.А. Теоретичні основи технології машинобудування. За ред. проф. М.В. Медвідя. Львів: Видавниче об'єднання «Вища школа», 1976. – 299 с.
2. Боровик А.І., Лінчевський П.А., Петраков Ю. В. Технологія машинобудування. Підручник.: ЖДТУ, Житомир. – 2005, 835 с.
3. Сучасні методи аналізу технологічних процесів у машинобудуванні: Навч. посібник /В.В. Душинський. – К.: 1СДО, 1994. – 216 с.
4. Технологія обробки на верстатах з ЧПК [Текст] : навч. посіб. для студ. машинобуд. спец. вищ. техн. навч. закл. / Гевко Б. М. [та ін.] ; Терноп. нац. техн. ун-т ім. Івана Пулюя, Каф. технології машинобуд. та автомобілів. – Т. : Крок, 2014. – 131 с. : табл., рис. – Бібліогр.: с. 126-128. - 300 экз. – **ISBN** 978-617-692-168-4.

– Internet sources:

1. Технологія машинобудування. Посібник-довідник для виконання кваліфікаційних робіт. – http://vlp.com.ua/node/3850
2. Машинобудування України: тенденції розвитку Бібліографічний список літератури. – http://library.zntu.edu.ua/bibliograf_pokaz/mashinobud.pdf
3. Технологія машинобудування Є.О. Горбатюк, М.П. Мазур, А.С. Зєнкін, В.Д. Каразей. – http://www.tnu.in.ua/study/refs/d184/file1357975.html
4. Нові технології виробництва ракет у КБ «Південне». – https://www.ukrmilitary.com/2018/12/new-technology-on-kb-pivdenne.html
5. The complete guide to machined parts. – https://www.3erp.com/blog/the-complete-guide-to-machined-parts/
6. Is Hybrid Manufacturing Technology the Future of Additive Manufacturing? – https://amfg.ai/2018/07/10/hybrid-technology-the-future-of-manufacturing/
7. Технологія машинобудування. Посібник-довідник для виконання кваліфікаційних робіт. Юрчишин І.І. та ін. – http://www.tnu.in.ua/study/refs/d184/file1357977.html